

closed by ice in several places on the 31st; navigation closed on north branch of Pennsylvania canal on the 17th; on the west branch on the 12th; canal frozen over on the 18th. *Connecticut*.—Springfield, Mass., 22nd, river closed with ice; 29th, river in many places clear of ice; Fall River, Mass., 22nd, North Watuppa Lake, frozen for first time this season. *St. Lawrence river*.—frozen over at Montreal on the 29th. *Newburyport, Mass.*—river and harbor entirely free from ice on 31st. *Lakes*.—Marquette, Mich., harbor frozen over from 18th to 21st. Grand Haven, Mich., harbor frozen over from 16th to 31st. Duluth, Minn., harbor frozen from 12th to 31st. Escanaba, Mich., ice in bay entire month. Port Huron, Mich., navigation closed on the 14th; Ft. Gratiot light extinguished for the season on the 19th. Alpena, Mich., last steamer of season left for Detroit on the 7th; bay full of ice on 12th. Chicago, Ill., lake frozen along the shore on the 15th; navigation closed on the 16th; all vessels laid up on the 17th. Buffalo, N. Y., canal navigation closed on the 6th, lake navigation on the 27th; Buffalo Creek and river frozen over on 26th. Oswego, N. Y., navigation closed on the 1st; all vessels laid up for the winter on the 11th. Detroit, Mich., floating ice in river on the 16th; ice along shore on the 26th. Cleveland, Ohio, navigation closed on the 9th; ice forming along the wharves on the 16th; river frozen over, 18th; floating ice in lake in large quantities on the 26th. Toledo, Ohio, navigation practically closed on the 4th; river partly covered by ice, 13th; frozen over, 16th; navigation closed, 17th. Erie, Pa., harbor lights discontinued for the season. *Lake Champlain*.—Burlington, Vt., ice broken up in river on the 15th; on the 15th at Rouse's Point, Can., 45 vessels fast in the ice, and between Rouse's Point and Sorel 100 vessels ice-bound; lake frozen over from Crown Point to Whitehall; people and teams crossing on ice between Ticonderoga and Bridgeport on the 26th; ice bridge between St. Alban's, Vt., and the islands in the lake firm on the 29th, and 6 inches thick in the thinnest part.

High Tides.—Cape Lookout, N. C., 13th; Macon, N. C., 13th, 14th, 15th, 16th; Atlantic City, N. J., 15th, very high tides, trains delayed in crossing the meadows.

Low Tides.—Indianola, 26th, 27th, 28th, 29th, 30th, 31st.

TEMPERATURE OF WATER.

The *temperatures of water*, as observed in rivers and harbors, with average depth at which observations were taken, are given in table on left side of chart No. II. At the following stations observations were not made on the dates indicated: on account of ice, at Alpena, from 21st to 31st, inclusive; Buffalo, 26th to 31st; Chicago, 15th to 31st; Detroit, 16th to 23rd and 26th to 31st; Duluth, 13th to 31st; Escanaba, 1st to 31st; Grand Haven, 16th to 31st; Marquette, 18th to 21st; Milwaukee, on the 21st and 23rd; Toledo, 16th to 31st. At Cleveland the lake was too rough for observations to be taken on the 7th, 10th, 11th, 15th and 22nd. At Savannah, 15th to 21st; at Punta Rassa, 6th to 31st, and Augusta, 14th to 25th, observations were interrupted by loss or breakage of thermometer.

ATMOSPHERIC ELECTRICITY.

Thunder-storms were reported in the various states on the following dates:—Pennsylvania, 11th; New Jersey, 6th; Maryland, 6th, Virginia, 6th, 26th; North Carolina, 6th; Georgia, 11th, 15th; Florida, 5th, 11th, 15th; Alabama, 5th; Mississippi and Louisiana, 5th, 10th; Texas, 4th, 5th, 9th, 10th, 13th, 23rd, 24th, 31st; Arkansas, 3rd, 9th, 24th; Indian Territory, 4th; Tennessee, 6th, 22nd, 23rd; Ohio, 9th, 21st, 22nd; Indiana, 3rd, 9th, 21st, 22nd; Michigan, 9th, 10th; Wisconsin, 9th; Iowa, 9th; Illinois, 9th, 10th, 21st; Missouri, 4th, 5th, 9th, 21st; Kansas, 4th, 5th, 9th, 30th.

Auroras.—Cornish, Me., 7th, 8th. Fall River, Mass., 12th. Thornville, Mich., 10th, 9 p. m., dimly defined arch with streamers. Argyle, N. Y., 17th, 9 p. m., diffuse light. Cambridge, Mass., regularly looked for at 8 p. m.; suspected, 7th, 9th; decidedly cloudy, 2nd, 3rd, 5th, 6th, 8th, 10th, 11th, 13th, 14th, 16th, 19th, 20th, 24th; some clouds or haze, 4th, 15th; some clouds and moonlight, 1st, 17th, 21st; moonlight, 18th, 26th, 27th; no record, 22nd, 23rd, 25th, 28th, 29th, 30th, 31st; aurora, if present, would have been seen on the 12th. Burlington, Vt., 7th, 11 p. m., an arch of light, of a pale green, with a few streamers above a well defined dark segment; 8th, 9 p. m., diffuse light. Wellsboro, Pa., 12th, 8.20 to 10.30 p. m.; 18th, 9 p. m. to midnight. Newport and Woodstock, Vt., 8th. Manitowoc, Wis., 7th, 11th.

Telegraphic communication interfered with by atmospheric electricity.—Bismarck, 10th, 22nd, 23rd; Coleman and Mason, Tex., 4th; Indianola, 5th, 12th, 18th.

OPTICAL PHENOMENA.

Solar Halos were observed in the various districts on the following dates: New England, 18th to 21st, 23rd to 25th, 28th to 31st. Middle Atlantic States, 1st to 3rd, 16th, 18th, 20th to 25th, 27th to 31st. South Atlantic States, 3rd, 4th, 8th, 11th, 19th to 22nd, 24th, 27th, 29th, 30th, 31st. Eastern Gulf States, 1st, 18th, 19th, 21st, 23rd, 27th, 28th. Western Gulf States, 1st, 2nd, 3rd, 18th to 23rd, 27th. Lower Lake region, 1st, 3rd, 18th, 23rd, 25th, 27th. Upper Lake region, 1st, 2nd, 20th, 24th, 25th, 27th, 28th, 31st. Ohio valley and Tennessee, 1st, 2nd, 19th, 24th to 28th, 30th. Upper Mississippi valley, 1st, 2nd, 6th, 10th, 11th, 15th, 17th, 20th, 24th, 26th to 30th. Missouri valley, 1st, 2nd, 3rd, 4th, 17th, 18th, 19th, 20th to 24th, 27th to 31st. Rocky Mountains, 2nd, 18th, 23rd, 26th, 27th, 28th. Western Plateau, 1st, 21st, 23rd, 26th, 28th, 30th. California, 5th, 23rd. Washington Territory, 4th.

Lunar Halos were observed in the various districts on the following dates: New England, 1st, 2nd, 3rd, 13th, 19th, 23rd to 25th, 27th, 30th; Middle Atlantic States, 3rd, 13th, 26th, 27th; South Atlantic